

of cloudiness and the deficiency in temperature. From the 2d to the 21st the temperature was generally below normal, with several well-defined cold waves, the most marked of which were those of the 8th, the 12th, and the 19th. The lowest temperature during the month in the three southern States occurred with the cold wave of the 8th. The greatest severity of the cold of the 12th was confined to Maine and Vermont, with temperatures ranging from 22° to 25° below zero. These figures were nearly paralleled on the 19th. During the last decade of the month the temperatures were decidedly higher, generally above normal, and without zero readings. The precipitation of the month was somewhat above normal, and occurred on an average of eleven days, but there was no day without a trace or more at some stations. There were no severe storms of either snow or wind. Gales of moderate force occurred on several dates, resulting in considerable delay and inconvenience to shipping, but without wrecks or loss of life. No gales occurred without warnings.—*J. W. Smith, District Forecaster.*

#### NEW ORLEANS FORECAST DISTRICT.

The month, as a whole, was unseasonably warm. Exceptionally high temperatures prevailed during the first half of the month. The precipitation was excessive in western Texas and Arkansas and at a few points in northwestern Louisiana and eastern Texas. No cold waves of any extent nor storm winds occurred during the month, and no warnings were issued. Frost or freezing temperature warnings were issued on six dates. A general freeze occurred over Arkansas, Oklahoma, the interior of Texas, and northwestern Louisiana on December 18, for which warnings were issued. Warnings were issued in advance of all frosts.—*I. M. Cline, District Forecaster.*

#### LOUISVILLE FORECAST DISTRICT.

The month was remarkable for the unusually large number of pressure areas that past across the central valleys, influencing the weather conditions over this district. The depressions were mostly large in area but rather weak in gradient, hence there were a great many cloudy, rainy days, but no destructive storms. The center of most of the disturbances past to the north of the Ohio River, keeping this district in southern quadrants, with the result that unusually mild temperatures prevailed. There was practically but one cold period, the 22d–26th, inclusive, which was also the only clear period. Light, moist snow fell at intervals during the period 19th–23d, but there was little or no snow on the ground at any time.

No cold wave or special warnings were issued and none were required, altho very decided falls in temperature were featured in the forecasts several times.—*F. J. Walz, District Forecaster.*

#### CHICAGO FORECAST DISTRICT.

The temperature was generally above normal over central and eastern portions of the district. Several periods of cold weather, with temperatures near zero, or below, marked the conditions over the western and northern portions. Cold-wave warnings were issued on several dates: 5th, 6th, 8th, 10th, 13th, 14th, 16th, 17th, and 31st, when the morning charts indicated the advance of the cold areas in the Northwest. The southern movement of these cold areas, however, was generally not extensive, the advance being usually well to the north. One of the most marked areas was that following the warnings issued on the 6th, and zero temperatures were recorded over Minnesota, Wisconsin, upper Michigan, and portions of northeastern Iowa. Temperatures of from 10° to 20° below zero were present in the valley of the Red River of the North on the morning of the 10th, but the intensity of the cold area was rapidly broken, and rising rather than falling temperatures occurred during its progress eastward. The warnings of the 14th applied to the middle Mississippi Valley, and altho zero temperatures were not reached decided falls of more than 20° occurred at nearly all stations to which warnings were sent.

The season for the display of storm warnings on the upper Lakes closed on the 18th. Only one display had been ordered up to that time. Warnings were issued on the morning of the 5th in advance of the storm which moved from the middle Rockies eastward and northeastward, passing across the Lake region during the night of the 5–6th and disappearing from the St. Lawrence Valley by the morning of the 8th. Northeast warnings were hoisted on Lake Superior and southeast on Lakes Michigan and Huron, and high winds with snow were reported from many of the display stations. No conditions warranting the issuance of advisory messages occurred after the close of the season.—*Frank H. Bigelow, Professor of Meteorology.*

#### DENVER FORECAST DISTRICT.

The month was unusually mild thruout the district. A deficiency of precipitation was noted on the middle-eastern slope and in southern Utah; elsewhere there was an excess, notably in northern and central Arizona, where the amounts were the greatest of record for December. There were no cold waves.—*Frederick H. Brandenburg, District Forecaster.*

#### SAN FRANCISCO FORECAST DISTRICT.

The month was marked by several severe storms. On December 3 a moderate disturbance developed over southern California and moved slowly eastward, causing rain south of the Tehachapi for several days. On the 6th a disturbance of great depth appeared on the Washington coast and caused rain and high southerly winds south of the Tehachapi. Another disturbance forty-eight hours later moved rapidly southeastward, also causing general rain. The most severe storm of the winter occurred on the 10th, covering the entire coast. At San Francisco a maximum wind velocity of 53 miles occurred; at Southeast Farallon, 72 miles, and at Point Reyes Light, 92 miles from the south. The storm did considerable damage thruout the southern portion of the State, and especially in the San Francisco Bay district. Warnings were given a few hours in advance of the storm. A period of comparatively quiet weather followed, lasting until the 22d. The last week of the year was marked by showery weather, with heavy rain on the 25th and 26th.—*Alexander G. McAdie, Professor and District Forecaster.*

#### PORTLAND, OREG., FORECAST DISTRICT.

Two severe storms swept this district during the month of December. The first was noted as approaching the Washington coast the morning of the 6th and warnings were at once sent to all seaports and inland stations were at once notified of the expected high winds. Fifteen hours later the winds had increased to a whole gale along the coast, and within twenty-four hours high winds were blowing at inland stations. The Oregonian editorially commended the work of the Weather Bureau in connection with this warning, saying that "with a warning so well in advance of the storm, there was plenty of time to make everything snug, and as a result, very little damage was reported".

The second storm was first noted as approaching the Oregon coast the morning of the 10th at which time there was some doubt as to whether it would move directly east or advance northeastward. It was finally decided that it would move northeastward and warnings were promptly issued. This storm proved to be as severe as the former one and the warnings were just as timely.

With the exception of these two storms the month was featureless, with no severe cold spells and with precipitation below normal west of the Cascade Mountains and generally slightly above normal to the east of this range of mountains.—*Edward A. Beals, District Forecaster.*

#### RIVERS AND FLOODS.

There were no floods of great consequence during the month. Stages were high for the season in the Ohio River

and the lower Mississippi River and its tributaries, but there were no floods except along the upper Yazoo watershed which was visited by a flood that for duration and height, considering the season of the year, was really remarkable. It was due to excessive rains over the headwaters of the Yazoo River from November 17 to 21, inclusive, supplemented by other heavy rains over northern Mississippi during the month of December. In the vicinity of Swanlake, Tallahatchie County, the river was above the flood stage of 24 feet from November 25 until after the close of the year. The maximum stage of 29.3 feet, which was the highest on record, was reached on December 2. Several thousand acres of cultivated lands in Tallahatchie and Leflore counties were under water from two to four weeks, and much unpicked cotton rotted in the fields. Some stock was lost in Quitman County, and the streets of several towns in adjoining counties were covered with water for several days.

Warnings were issued on the 16th for a moderate flood stage in the lower Wabash River, and on the 21st for moderately high stages in the lower Ohio. These warnings were verified within a small fraction of a foot, and resulted in the saving of corn, logs, and musselshells valued at thousands of dollars.

There was also a local flood in the Middle Trinity River of Texas from the 22d to the 28th, inclusive, due to excessive rainfall on the 15th and 16th. The flood was limited to the vicinity of Long Lake, Tex., and attention to the warnings

issued prevented any damage. The highest stage reached at Long Lake was 40.4 feet, 5.4 feet above the flood stage.

Heavy rains over the valley caused two decided rises in the Sacramento River during the month, but flood stages were not reached except at Colusa, Cal., where the flood stage of 25 feet was exceeded by 0.2 foot on the 28.

The Missouri River closed at Pierre, S. Dak., on the 13th, but at the end of the month it was still practically open at Sioux City, Iowa. The Mississippi closed at Leclaire, Iowa, on the 21st, but was still open at Davenport, Iowa, at the end of the month. On both rivers conditions were quite similar to those of December, 1905. Floating ice first appeared at St. Louis, Mo., on the 20th, and on the following day navigation between St. Louis, Mo., and Cairo, Ill., was suspended. Ice appeared in the Mississippi River at Cairo on the 24th, but none was reported south of that place. The larger eastern rivers, except those of New England, remained open.

The highest and lowest water, mean stage, and monthly range at 289 river stations are given in Table VI. Hydrographs for typical points on seven principal rivers are shown on Chart I. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor of Meteorology.*

## THE WEATHER OF THE MONTH.

By Mr. P. C. DAY, Assistant Chief, Division of Meteorological Records.

### PRESSURE.

The distribution of mean atmospheric pressure for December, 1906, over the United States and Canada is graphically shown on Chart VI, and the average values and departures from the normal are shown for each station in Tables I and V.

During December, 1906, the distribution of mean pressure showed several marked variations from the normal. The ridge of high mean pressure that usually extends from the south Atlantic coast northwesterly to the middle and northern Plateau districts, with the crest, about 30.20 inches, over southern Idaho, was largely replaced in the region west of the Mississippi Valley by comparatively low pressure. The ridge of highest mean pressure for the month extended from the South Atlantic and east Gulf States northwesterly over the Lake region, upper Mississippi Valley, North Dakota, and into the Canadian provinces of Manitoba and western Ontario, with the crest apparently north of the field of observation. The unusual persistence and strength of the great anticyclonic area that prevailed in the region north of the Great Lakes was conducive to the projection southward of numerous areas of high pressure which, spreading over the Dakotas, upper Mississippi Valley, Lake region, and thence eastward, gave to those districts rapid and severe changes in weather conditions.

Areas of high pressure were markedly absent from the districts west of the Rocky Mountains and over the middle and southern slope regions. The average pressure during the month exceeded the normal over nearly all parts of the United States and Canada, and was decidedly above the average along the northern border and in the Canadian districts from Manitoba to the St. Lawrence River and northward toward Hudson Bay, where the monthly averages exceeded the normal from 0.20 to 0.25 inch.

A slight deficiency in pressure, less than .05 inch, was general over the middle Plateau and central Pacific districts.

An unusual number of low pressure areas developed on the Pacific coast, that of the 10th being especially severe over the entire coast, with unusually high winds in the vicinity of San Francisco. In the presence of the extensive area of high pressure along the northern boundary, the paths of the lows

eastward from the Rocky Mountain region were generally south of their normal tracks.

### TEMPERATURE.

The temperature during December, 1906, averaged below the normal along the entire northern border from the Rocky Mountains eastward to the Atlantic. Over eastern Montana, North Dakota, northwestern Minnesota, and the greater part of New England the temperature during the first two decades of the month was unusually low, due to the rapid succession of areas of high pressure over those districts. The temperature was also below normal over the Florida Peninsula, especially in the central and southern districts, where phenomenally cold weather prevailed from the 23d to 27th, with frost and freezing weather nearly to the southern limit of the State.

A slight deficiency existed in the Sacramento Valley of California, due probably to the effect of air drainage from the surrounding mountains which were heavily covered with snow.

From the lower Mississippi Valley westward, over Texas, the middle and southern Rocky Mountain districts, and the whole of the Plateau region the month was unusually warm, the average excess ranging from 4° to 8° daily above the normal. No severe cold waves occurred over this extensive region and the temperature, with but few short exceptions, was continuously above the average.

Maximum temperatures of 80°, or higher, were confined to a small area of southern Texas and portions of southwestern Arizona and southern California. Over the northern portions of North Dakota, Minnesota, Wisconsin, and Michigan the maximum temperature did not reach 40°.

Minimum temperatures from 20° to 40° below zero were recorded in North Dakota and northern Minnesota on the 10th, and again on the 17th, and from 20° to 30° below zero over northern New England on the 12th and 19th.

Aside from the above-mentioned districts, minimum temperatures were not unusually low in any part of the United States except over central and southern Florida.

### PRECIPITATION.

The precipitation was less than average over the South